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10/552,399	10/07/2005	Thomas Kohler	PHDE030097US	9293

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EXAMINER	
CORBETT, JOHN M	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/552,399	Applicant(s) KOHLER ET AL.	
	Examiner John M. Corbett	Art Unit 2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 October 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *07 October 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *07 October 2005*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

1. Claim 9 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

With respect to claim 9, the claim is drawn to a computer program. A computer program is an abstract set of instructions. Therefore, a computer program is not a physical thing (product) nor a process as they are not "acts" being performed. As such, this claim is not directed to one of the statutory categories of invention (See MPEP 2106.01), but directed to nonstatutory functional descriptive material.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claim 1, 3-10 and 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grangeat et al. ("Theoretical framework for a dynamic cone-beam reconstruction algorithm on a

dynamic particle model", 17 July 2002, Phys. Med. Biol., 47, pages 2611-2625) in view of Kachelriess et al. ("Kymogram detection and kymogram-correlated image reconstruction from subsecond spiral computed tomography scans of the heart", July 2002, Med. Phys., volume 29, number 7, pages 1489-1503) and Cesmeli (6,434,215).

With respect to claim 1, Grangeat et al. teaches a method comprising the steps:

using a radiation source to generate a cone-shaped beam cluster which passes through an examination area and a periodically moving object which is located in the examination area (Title and Abstract),

producing a relative movement between the radiation source on the one hand and the object located in the examination area on the other hand, where a trajectory, along which the radiation source moves relative to the object, runs on an imaginary cylindrical surface that surrounds the object (Figure 1a),

using a detector unit to acquire measured values which depend on the intensity in the beam cluster on the other side of the object, during the relative movement (Figure 1a),

reconstructing a spatial distribution of the absorption of the periodically moving object from the measured values, comprising the steps:

b) subjecting the measured values to parallel rebinning in order to form a number of groups, where the beams corresponding to the measured values of each group form beam fans which lie in planes that are parallel to one another and to the axis of rotation (Figure 2),

c) determining for each group a measured value whose beam irradiates the spatial area taken up by the object, and allocating to the respective group the point in time at which this measured value was acquired (Pages 2618-2120, Section 4.1.3.2, i.e. cartoon like step-by-step motion),

e) reconstructing the absorption distribution in the object from the measured values belonging to the groups (Page 2615, Section 4.1, dynamic region of interest reconstructed).

Grangeat et al. fails to teach recording the periodic movement of the object during the acquisition and determining those groups whose points in time lie within periodic, predefined time ranges.

Kachelriess et al. teaches recording the periodic movement of the object during the acquisition (Abstract) and determining those groups whose points in time lie within periodic, predefined time ranges (Abstract, reconstruction synchronized with cardiac motion).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Grangeat et al. to include the recording and determining of Kachelriess et al., since a person would have been motivated to make such a modification to improve image quality by reducing motion artifacts (Abstract and Page 1501, Col. 1, lines 9-11) as taught by Kachelriess et al.

Grangeat et al. fails to explicitly teach a) determining the spatial area taken up by the object in the examination area.

Cesmeli teaches a) determining the spatial area taken up by the object in the examination area (Col. 5, lines 45-48).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate into the method of Grangeat et al. as modified above the determining of Cesmeli, since a person would have been motivated to make such a modification to improve imaging and reduce reconstruction time by reconstructing an image centered on the region of interest utilizing extracted data for the reconstruction (Col. 5, lines 48-52) as implied by Cesmeli.

With respect to claim 3, Grangeat et al. as modified above suggests the method as recited above. Cesmeli further teaches wherein in step c) the geometric center of the spatial area taken up by the object in the examination area is determined (Col. 5, lines 48-52) and for each group a measured value is necessarily determined whose beam runs through the geometric center. Grangeat et al. further teaches where the point in time at which this measured value was acquired is allocated to the respective group (Pages 2618-2120, Section 4.1.3.2, i.e. cartoon like step-by-step motion).

With respect to claim 4, Grangeat et al. as modified above suggests the method as recited above. Kachelriess et al. further teaches wherein the periodically moving object is a heart, where the periodic time ranges are predefined with the aid of an electrocardiograph (Abstract).

With respect to claim 5, Grangeat et al. as modified above suggests the method as recited above. Cesmeli further teaches wherein the object moves less in the periodic, predefined time ranges than in other time ranges (Figure 3).

With respect to claim 6, Grangeat et al. as modified above suggests the method as recited above. Grangeat et al. further teaches wherein the reconstruction is carried out with the aid of a filtered back-projection (Page 2615, section 4.1).

With respect to claim 7, Grangeat et al. as modified above suggests the method as recited above. Grangeat et al. further teaches wherein the relative movement between the radiation source on the one hand and the object located in the examination area on the other hand comprises a rotation about an axis of rotation and runs in a circular (Figure 1a).

With respect to claim 8, Grangeat et al. as modified above suggests the method as recited above. Kachelriess et al. further teaches a movement recording device, in particular an electrocardiograph, for recording the periodic movement of the object during the acquisition (Abstract) and at least one reconstruction and image processing computer for reconstructing the spatial distribution of the absorption within the examination area from the measured values acquired by the detector unit, with the aid of the periodic movement of the object recorded by the movement recording device (Page 1490, Col. 2, lines 47-54 and Page 1491, Col. 1, lines 22-29).

Cesmeli further teaches a drive arrangement (30) for rotating the object located in the examination area and the radiation source relative to one another about an axis of rotation and moving them relative to one another parallel to the axis of rotation,

a detector unit for acquiring measured values, said detector unit being coupled to the radiation sources (Figure 2),

a control unit for controlling the radiation source, the drive arrangement the detector unit, the movement recording device and the at least one reconstruction and image processing computer (Figure 2).

With respect to claim 9, Grangeat et al. as modified above suggests the method as recited above. Cesmeli further teaches a drive arrangement (30) for rotating the object located in the examination area and the radiation source relative to one another about an axis of rotation and moving them relative to one another parallel to the axis of rotation,

a detector unit for acquiring measured values, said detector unit being coupled to the radiation sources (Figure 2),

a control unit for controlling the radiation source, the drive arrangement the detector unit, the movement recording device and the at least one reconstruction and image processing computer (Figure 2), and

a computer program (Col. 2, lines 16-18 and item 36, computer controls apparatus).

With respect to claim 10, Grangeat et al. teaches a method comprising:

b) forming a number of group from measured values of the object (Figure 1b),

c) determining for each group a measured value whose beam irradiates the spatial area taken up by the object, and allocating to the respective group the point in time at which this measured value was acquired (Pages 2618-2120, Section 4.1.3.2, i.e. cartoon like step-by-step motion),

e) reconstructing the absorption distribution in the object from the measured values belonging to the groups (Page 2615, Section 4.1, dynamic region of interest reconstructed).

Grangeat et al. fails to teach determining those groups whose points in time lie within periodic, predefined time ranges.

Kachelriess et al. teaches determining those groups whose points in time lie within periodic, predefined time ranges (Abstract, reconstruction synchronized with cardiac motion).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Grangeat et al. to include the determining of Kachelriess et al., since a person would have been motivated to make such a modification to improve image quality by reducing motion artifacts (Abstract and Page 1501, Col. 1, lines 9-11) as taught by Kachelriess et al.

Grangeat et al. fails to explicitly teach a) determining the spatial area taken up by the object.

Cesmeli teaches a) determining the spatial area taken up by the object in the examination area (Col. 5, lines 45-48).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate into the method of Grangeat et al. as modified above the determining of Cesmeli, since a person would have been motivated to make such a modification to improve imaging and reduce reconstruction time by reconstructing an image centered on the region of interest utilizing extracted data for the reconstruction (Col. 5, lines 48-52) as implied by Cesmeli.

With respect to claim 12, Grangeat et al. as modified above suggests the method as recited above. Kachelriess et al. further teaches wherein the periodically moving object is a heart, where the periodic time ranges are predefined with the aid of an electrocardiograph (Abstract).

With respect to claim 13, Grangeat et al. as modified above suggests the method as recited above. Cesmeli further teaches wherein the object moves less in the periodic, predefined time ranges than in other time ranges (Figure 3).

With respect to claim 14, Grangeat et al. teaches an apparatus comprising:

b) means for forming a number of group from measured values of the object (Figure 2),

c) means for determining for each group a measured value whose beam irradiates the spatial area taken up by the object, and allocating to the respective group the point in time at which this measured value was acquired (Pages 2618-2120, Section 4.1.3.2, i.e. cartoon like step-by-step motion),

e) means for reconstructing the absorption distribution in the object from the measured values belonging to the groups (Page 2615, Section 4.1, dynamic region of interest reconstructed).

Note: Grangeat et al. necessarily includes the means (via a computer) for forming, determining and reconstructing noted above.

Grangeat et al. fails to teach d) means for determining those groups whose points in time lie within periodic, predefined time ranges.

Kachelriess et al. teaches d) means for determining those groups whose points in time lie within periodic, predefined time ranges (Abstract, reconstruction synchronized with cardiac motion, Page 1490, Col. 2, lines 47-51 and Page 1481, Col. 1, lines 22-29).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Grangeat et al. to include the means for determining of Kachelriess et al., since a person would have been motivated to make such a modification to improve image quality by reducing motion artifacts (Abstract and Page 1501, Col. 1, lines 9-11) as taught by Kachelriess et al.

Grangeat et al. fails to explicitly teach a) means for determining the spatial area taken up by the object.

Cesmeli teaches a) means for determining the spatial area taken up by the object (Col. 5, lines 45-48 and Figure 2).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate into the apparatus of Grangeat et al. as modified above the determining of Cesmeli, since a person would have been motivated to make such a modification to improve imaging and reduce reconstruction time by reconstructing an image centered on the region of interest utilizing extracted data for the reconstruction as implied by Cesmeli (Col. 5, lines 48-52).

3. Claim 1-2 and 4-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grangeat et al. in view of Kachelriess et al. and Ebrahimifard et al. (6,396,897).

With respect to claim 1, Grangeat et al. teaches a method comprising the steps:

using a radiation source to generate a cone-shaped beam cluster which passes through an examination area and a periodically moving object which is located in the examination area (Title and Abstract),

producing a relative movement between the radiation source on the one hand and the object located in the examination area on the other hand, where a trajectory, along which the radiation source moves relative to the object, runs on an imaginary cylindrical surface that surrounds the object (Figure 1a),

using a detector unit to acquire measured values which depend on the intensity in the beam cluster on the other side of the object, during the relative movement (Figure 1a),

reconstructing a spatial distribution of the absorption of the periodically moving object from the measured values, comprising the steps:

b) subjecting the measured values to parallel rebinning in order to form a number of groups, where the beams corresponding to the measured values of each group form beam fans which lie in planes that are parallel to one another and to the axis of rotation (Figure 2),

c) determining for each group a measured value whose beam irradiates the spatial area taken up by the object, and allocating to the respective group the point in time at which this measured value was acquired (Pages 2618-2120, Section 4.1.3.2, i.e. cartoon like step-by-step motion),

e) reconstructing the absorption distribution in the object from the measured values belonging to the groups (Page 2615, Section 4.1, dynamic region of interest reconstructed).

Grangeat et al. fails to teach recording the periodic movement of the object during the acquisition and determining those groups whose points in time lie within periodic, predefined time ranges.

Kachelriess et al. teaches recording the periodic movement of the object during the acquisition (Abstract) and determining those groups whose points in time lie within periodic, predefined time ranges (Abstract, reconstruction synchronized with cardiac motion).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Grangeat et al. to include the recording and determining of Kachelriess et al., since a person would have been motivated to make such a modification to improve image quality by reducing motion artifacts (Abstract and Page 1501, Col. 1, lines 9-11) as taught by Kachelriess et al.

Grangeat et al. fails to explicitly teach a) determining the spatial area taken up by the object in the examination area.

Ebrahimifard et al. teaches a) determining the spatial area taken up by the object in the examination area (102).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate into the method of Grangeat et al. as modified above the determining of Ebrahimifard et al., since a person would have been motivated to make such a modification to improve imaging in a more simple manner (Col. 1, lines 59-67 and Col. 2, lines 25-28) as taught by Ebrahimifard et al.

With respect to claim 2, Ebrahimifard et al. further teaches wherein the determination of the spatial area taken up by the object, in step a), comprises the following steps:

reconstructing from the measured values a three-dimensional data record which contains the object, with a resolution which makes it possible to segment the object in the three-dimensional data record (100),

segmenting the object in the three-dimensional data record, where the segmented object shows the spatial area taken up by the object in the examination area (102-122).

With respect to claim 4, Grangeat et al. as modified above suggests the method as recited above. Kachelriess et al. further teaches wherein the periodically moving object is a heart, where the periodic time ranges are predefined with the aid of an electrocardiograph (Abstract).

With respect to claim 5, Grangeat et al. as modified above suggests the method as recited above. Grangeat et al. further teaches wherein the object moves less in the periodic, predefined time ranges than in other time ranges (Page 2612, i.e. heart).

With respect to claim 6, Grangeat et al. as modified above suggests the method as recited above. Grangeat et al. further teaches wherein the reconstruction is carried out with the aid of a filtered back-projection (Page 2615, section 4.1).

With respect to claim 7, Grangeat et al. as modified above suggests the method as recited above. Grangeat et al. further teaches wherein the relative movement between the radiation

source on the one hand and the object located in the examination area on the other hand comprises a rotation about an axis of rotation and runs in a circular (Figure 1a).

With respect to claim 8, Grangeat et al. as modified above suggests the method as recited above. Kachelriess et al. further teaches a movement recording device, in particular an electrocardiograph, for recording the periodic movement of the object during the acquisition (Abstract) and at least one reconstruction and image processing computer for reconstructing the spatial distribution of the absorption within the examination area from the measured values acquired by the detector unit, with the aid of the periodic movement of the object recorded by the movement recording device (Page 1490, Col. 2, lines 47-54 and Page 1491, Col. 1, lines 22-29).

Ebrahimifard et al. further teaches a drive arrangement (30) for rotating the object located in the examination area and the radiation source relative to one another about an axis of rotation and moving them relative to one another parallel to the axis of rotation,

a detector unit for acquiring measured values, said detector unit being coupled to the radiation sources (Figure 2),

a control unit for controlling the radiation source, the drive arrangement the detector unit, the movement recording device and the at least one reconstruction and image processing computer (Figure 2).

With respect to claim 9, Grangeat et al. as modified above suggests the method as recited above. Ebrahimifard et al. further teaches a computer program (Col. 4, lines 50-58 and item 36, computer controls apparatus),

a drive arrangement (30) for rotating the object located in the examination area and the radiation source relative to one another about an axis of rotation and moving them relative to one another parallel to the axis of rotation,

a detector unit for acquiring measured values, said detector unit being coupled to the radiation sources (Figure 2),

a control unit for controlling the radiation source, the drive arrangement the detector unit, the movement recording device and the at least one reconstruction and image processing computer (Figure 2).

With respect to claim 10, Grangeat et al. teaches a method comprising:

b) forming a number of group from measured values of the object (Figure 1b),

c) determining for each group a measured value whose beam irradiates the spatial area taken up by the object, and allocating to the respective group the point in time at which this measured value was acquired (Pages 2618-2120, Section 4.1.3.2, i.e. cartoon like step-by-step motion),

e) reconstructing the absorption distribution in the object from the measured values belonging to the groups (Page 2615, Section 4.1, dynamic region of interest reconstructed).

Grangeat et al. fails to teach determining those groups whose points in time lie within periodic, predefined time ranges.

Kachelriess et al. teaches determining those groups whose points in time lie within periodic, predefined time ranges (Abstract, reconstruction synchronized with cardiac motion).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Grangeat et al. to include the determining of Kachelriess et al., since a person would have been motivated to make such a modification to improve image quality by reducing motion artifacts (Abstract and Page 1501, Col. 1, lines 9-11) as taught by Kachelriess et al.

Grangeat et al. fails to explicitly teach a) determining the spatial area taken up by the object.

Ebrahimifard et al. teaches a) determining the spatial area taken up by the object in the examination area (102).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate into the method of Grangeat et al. as modified above the determining of Ebrahimifard et al., since a person would have been motivated to make such a modification to improve imaging in a more simple manner (Col. 1, lines 59-67 and Col. 2, lines 25-28) as taught by Ebrahimifard et al.

With respect to claim 11, Ebrahimifard et al. further teaches wherein the determination of the spatial area taken up by the object, in step a), comprises the following steps:

reconstructing from the measured values a three-dimensional data record which contains the object, with a resolution which makes it possible to segment the object in the three-dimensional data record (100),

segmenting the object in the three-dimensional data record, where the segmented object shows the spatial area taken up by the object in the examination area (102-122).

With respect to claim 12, Grangeat et al. as modified above suggests the method as recited above. Kachelriess et al. further teaches wherein the periodically moving object is a heart, where the periodic time ranges are predefined with the aid of an electrocardiograph (Abstract).

With respect to claim 13, Grangeat et al. as modified above suggests the method as recited above. Grangeat et al. further teaches wherein the object moves less in the periodic, predefined time ranges than in other time ranges (Page 2612, line 3, i.e. heart).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John M. Corbett whose telephone number is (571) 272-8284. The examiner can normally be reached on M-F 8 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward J. Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would

like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

13 November 2007 JMC

SUPERVISORY PATENT EXAMINER
EDWARD J. GLICK